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Sand and gravel extraction



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Citation:

Van Lancker, V., Lauwaert, B., De Mol, L., Vandenreyken, H., De Backer, A., Pirlet, H., 2013. Sand and gravel extraction. In: Lescrauwaet, A.K., Pirlet, H., Verleye, T., Mees, J., Herman, R. (Eds.), Compendium for Coast and Sea 2013: integrating knowledge on the socio-economic, environmental and institutional aspects of the Coast and Sea in Flanders and Belgium. Oostende, Belgium, p. 121-130.

Up to 100 million m³ of marine sediments are annually extracted in the OSPAR Region. These are mainly sand and gravel for the construction industry and beach nourishment. Furthermore, marl is extracted to improve farmland and to filter water (*OSPAR QSR 2010*¹⁹⁸⁸¹⁷). Most of the marine sediment is extracted in the North Sea by countries such as the Netherlands (62.9 million m³ of extracted sediment in 2012), United Kingdom (11.5 million m³ of extracted sediment in 2012), France (7.7 million m³ of extracted sediment in 2012) and Denmark (5 million m³ of extracted sediment in 2012) (*Report of the Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (ICES, WGEXT) 2012*²²⁵⁴¹³). On the Belgian continental shelf (BCS), most of the extracted sediment is sand with an annual volume that fluctuated in the last ten years between 1.5 and 2.5 million m³ and amounted to more than 3 million m³ in 2012. Due to the low quality, the extraction of gravel is less important (Source: FPS Economy, Continental Shelf Service).

4.1 Policy context

The sand and gravel extraction on the BCS is a federal competence that belongs to the FPS Economy, SMEs, Self-employed and Energy and is regulated by the *law of 13 June 1969*. The coordination of the parties involved in the management of the exploration and exploitation on the continental shelf and in the territorial sea is executed by an advisory committee (*Royal Decree of 12 August 2000*).

4.2 Spatial use

The geographical demarcation and accessibility of the zones for the exploitation and exploration of mineral and other non-living resources in the territorial sea and on the continental shelf have been registered in the *Royal Decree of 1 September 2004* (table 1 and figure 1). Prior to this demarcation, a study about the possible concession zones for sand extraction was conducted (*Schotte 1999*¹²⁸⁵¹⁴). In total, 3 control zones have been demarcated in sectors for which concessions can be obtained. A fourth control zone was defined in 2010, in which 4 new sectors were demarcated based on new exploration data (*Ministerial Decree of 24 December 2010*). If a negative seabed evolution occurs due to extraction that does not meet the legal requirements (max. 5 m relative to a reference level), certain sections of the zones can be closed.

Table 1. An overview of the different control zones for sand extraction in the Belgian part of the North Sea (BNS) with their location and accessibility (RD to be published).

CONTROL ZONE	SECTOR	LOCATION	ACCESSIBILITY
1	A	Thornton Bank	Open, except for the area THBREF
	B	Goote Bank	Use is not recommended due to a new IMO-shipping route
2	A, B	Kwinte Bank	Open, except for KBMA and KBMB
	C	Buiten Ratel – Oostdyck	Open
3	A	Sierra Ventana	Open
	B	Sierra Ventana	Closed as long as the sector is used as a dumping site for dredged material
4	A	Noordhinder	Open
	B	Oosthinder	Open
	C	Oosthinder	Open
	D	Westhinder	Open

The extraction of sand and gravel at sea requires a concession permit (figure 2). In order to obtain a permit, an application form has to be submitted to the director of the Directorate General Quality and Safety of the FPS Economy according to the procedure stipulated in the *Royal Decree of 1 September 2004*. Furthermore, the *Royal Decree of 1 September 2004 concerning the environmental impact assessment (EIA)* defines that an environmental impact report has to be submitted to the Management Unit of the North Sea Mathematical Models (MUMM) (RBINS) (*MER voor de extractie van mariene aggregaten op het BNZ, 2006*¹⁰¹³⁸⁷, *MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010*²¹⁴⁸⁵⁷). The EIA by MUMM (*milieueffectenbeoordeling Pichot 2006*²¹⁴⁸⁵⁸) is transferred to the minister/state secretary competent for Economy (Source: [website FPS Economy](#)).

THE DEMARCATION OF THE CONTROL ZONES FOR SAND EXTRACTION ON THE BCS

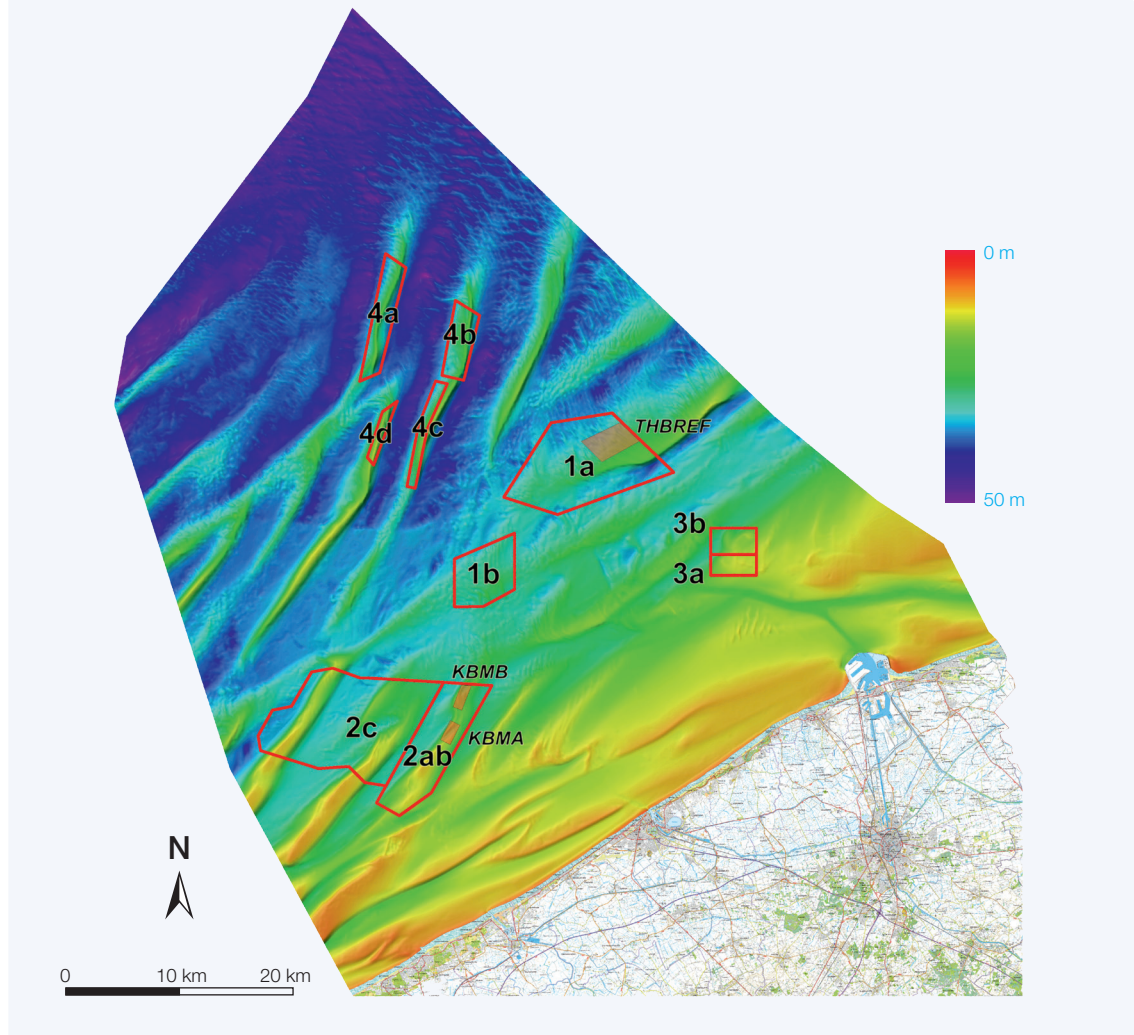


Figure 1. The demarcation of the control zones for sand extraction on the BCS (Source: FPS Economy, Continental Shelf Service, RD to be published).

The concessions that have been granted for the exploration and exploitation of the mineral and other non-living resources on the BCS are to be found in the Ministerial Decrees in the Belgian Official Journal (*Belgisch staatsblad*) (table 2).

In the draft of the Marine Spatial Plan (*Ontwerp van koninklijk besluit tot vaststelling van het marien ruimtelijk plan, 2013*²²⁷⁵²⁷), as proposed by the Minister competent for the North Sea, some spatial policy choices have been formulated concerning sand and gravel extraction on the BCS:

- The four existing extraction areas are preserved;
- The sectors of zone 2 are redefined in view of shipping safety and environmental protection;
- The introduction of an appropriate assessment as an additional part of the environmental impact report for the concessions within the marine protected area 'Flemish Banks' (see theme **Nature and environment**);
- The maximum allowed extraction volumes are preserved with a gradual decrease of the extractions in the Habitats Directive Areas (see theme **Nature and environment**);
- Multiple use of space is possible given the temporary character of the extraction activities.

PROCEDURE FOR A CONCESSION PERMIT AND THE EXPLOITATION OF SAND AND GRAVEL EXTRACTION IN THE BNS

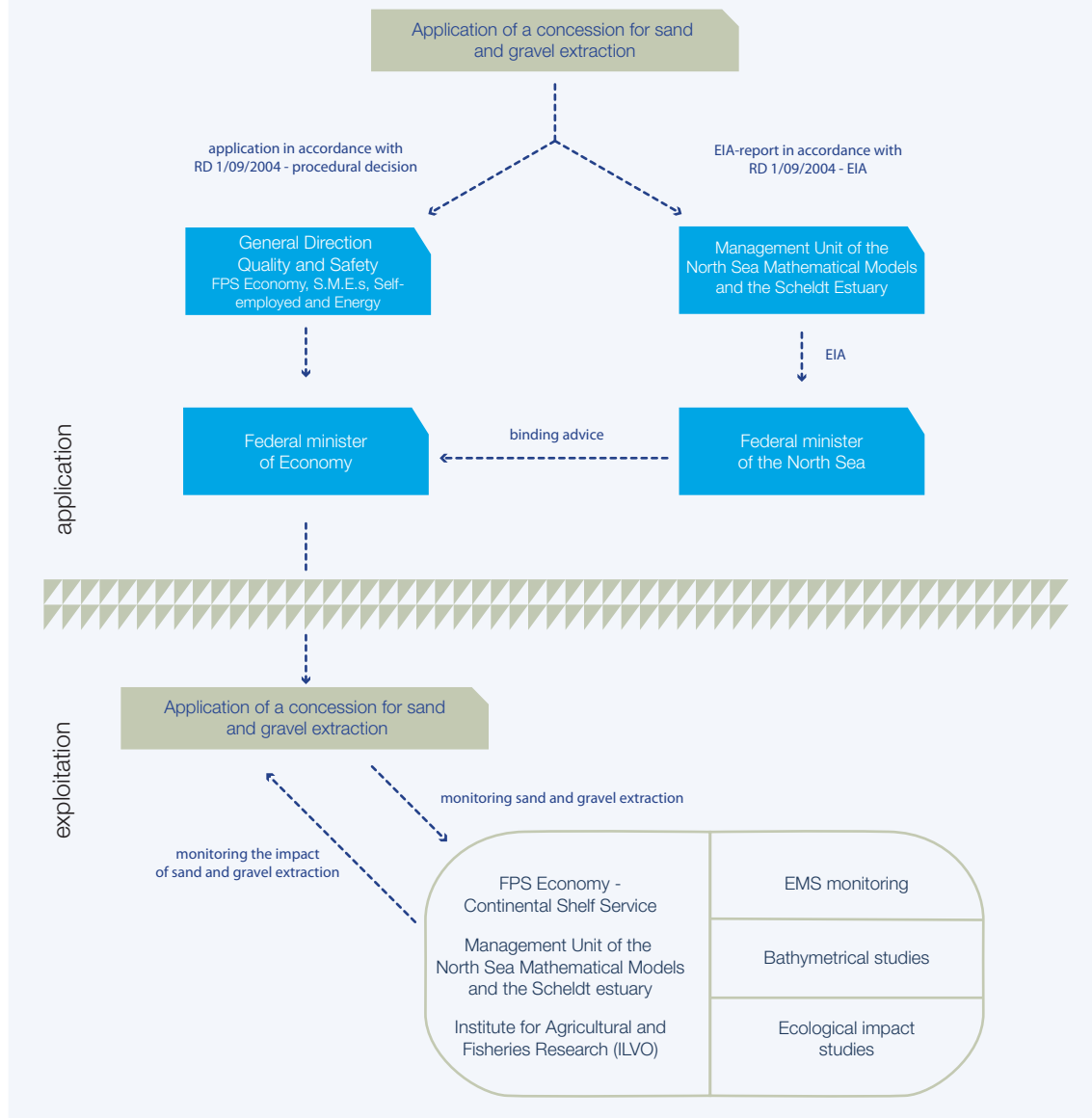


Figure 2. Flowchart of the procedure for a concession permit and the exploitation of sand and gravel extraction in the BNS (law of 13 June 1969 and associated Royal Decrees).

4.3 Societal interest

The extraction of sand and gravel on the BCS has strongly increased over the past few years (figure 3). In 1976, a sediment volume of 29,000 m³ was extracted; this volume had risen to 3.2 million m³ in 2012. A maximum volume of approximately 4 million m³ was reached in 1997 due to the construction of submarine pipelines (Interconnector and NorFra) (Goffin et al. 2007¹¹⁴²²⁵, André et al. 2010²⁰⁰⁶¹³, see also theme **Energy (incl. cables and pipelines)**).

Between 2003 and 2012 more than 75% of the sediment was extracted in zone 2 with a gradual shift from sectors 2A and 2B to 2C (Roche et al. 2011²⁰⁸⁶⁸¹). Currently, a maximum of 15 million m³ of sediment may be extracted in the

Table 2. An overview of the concessionaires for sand extraction in the BNS with the maximum extraction volume for 2013 (Source: FPS Economy, Continental Shelf Service).

CONCESSIONAIRE	MAXIMUM EXTRACTION VOLUME FOR 2013
Charles Kesteleyn NV	100,000 m ³
Dranaco NV	100,000 m ³
CEI - De Meyer NV	140,000 m ³
Satic NV	150,000 m ³
De Hoop Handel BV c.o. Satic NV	150,000 m ³
TV Zeezand Exploitatie NV	175,000 m ³
Alzagri NV	200,000 m ³
DC Industrial	300,000 m ³
Vlaamse Overheid – Afdeling Maritieme Toegang	350,000 m ³
DEME Building Materials NV	400,000 m ³
Belmagri NV	500,000 m ³
Nieuwpoortse Handelsmaatschappij NV	550,000 m ³
Hanson Aggregates Belgium NV	600,000 m ³
Vlaamse Overheid – Afdeling Kust	550,000 m ³ and 2,000,000 m ³ (Masterplan Coastal Safety)

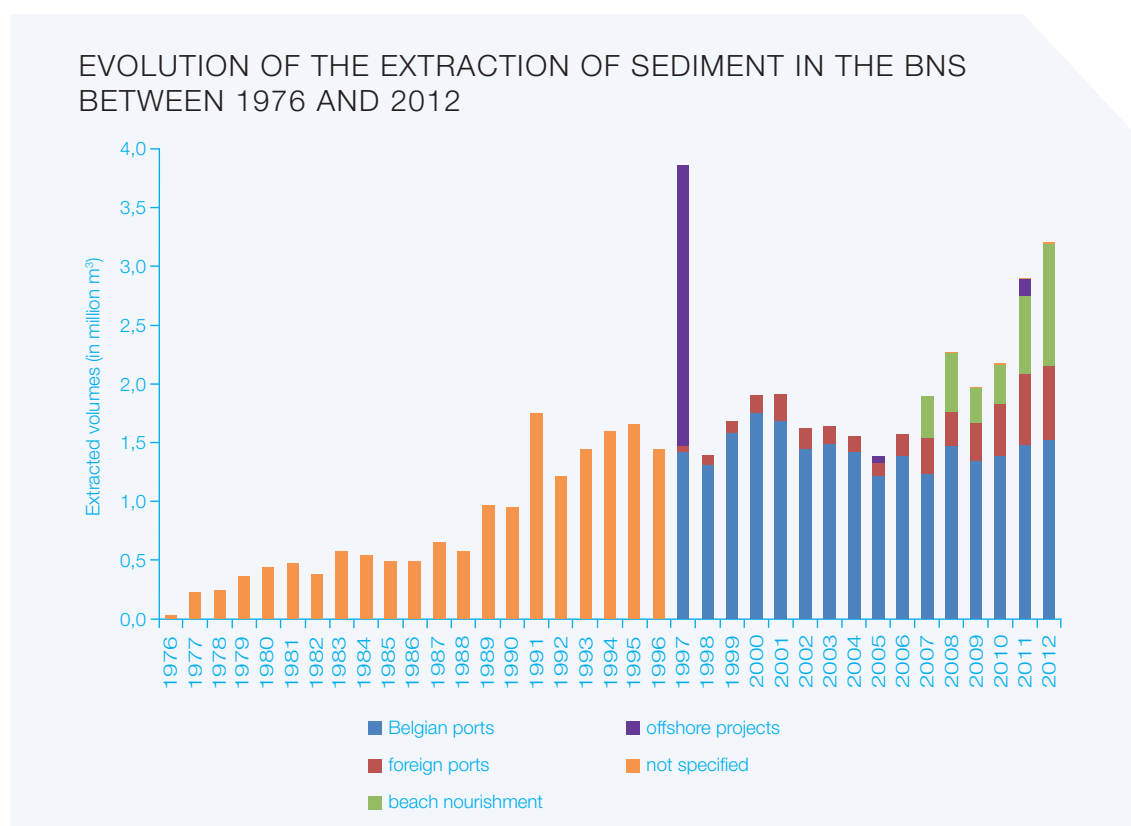


Figure 3. Evolution of the extraction of sediment in the BNS between 1976 and 2012. Remark: construction of submarine pipelines in 1991 and 1997 (Source: FPS Economy, Continental Shelf Service).

control zones over a period of 5 years. This sediment is mainly landed in Flanders, although some sediment is also unloaded in the harbours of France and the Netherlands (up to 16% in 2007) ([De Smet et al. 2009](#)²¹⁴⁴⁹¹).

The sediments on the BCS are used for coastal protection (beach nourishments) and other maritime works. Recently, new concession zones have been defined in the Hinder Banks region. These zones should provide 35 million m³ of sediment during the next 10 years in the context of the Masterplan Coastal Safety and the OW-plan in Ostend ([MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010](#)²¹⁴⁸⁵⁷, [Mathys et al. 2011](#)²⁰⁸⁷⁶³, [Rumes et al. 2011](#)²⁰⁸⁷⁷²) (see theme **Safety against flooding**). On the other hand, the sediments in BNS constitute an important source of construction materials. Depending on the quality and the grain size, the sediment is used as a filling sand, as raw material for asphalt production or in the concrete industry ([Van De Kerckhove 2011](#)²⁰⁹³³²).

4.3.1 Employment

According to a study by Zeegra vzw concerning the economic importance of sand extraction in the BNS ([het economisch belang van de sector van zandwinning op zee in België \(2004\)](#)¹²⁷¹⁰⁹), 295 persons were employed in this sector in 2002. This is an increase of 18.5% compared to employment in 1998. 39.3% of employment in the sector of offshore sand extraction is situated in the province of West Flanders. The feasibility study of the Flanders Marine vzw (the current [Flanders Maritime Cluster](#)) indicates that in 2008, 0.7 % of total direct employment in the marine/maritime sector in the Flemish Region (50,195 jobs) was situated in the sector of raw materials extraction.

4.3.2 Turnover and gross value added

In 2002, the total turnover of 19 out of 22 companies, active in the offshore sand extraction sector was estimated at 264,931,000 euros. Over the period 1998-2002, the turnover of these 19 companies increased by 45.4%. The total gross value added of these 22 companies amounted to 31.245 million euros in 2002, representing an increase of 74.4% in comparison to 1998 ([Het economisch belang van de sector van zandwinning op zee in België \(2004\)](#)¹²⁷¹⁰⁹).

4.4 Impact

The most commonly used vessel for sand extraction is the trailing suction hopper dredger, which makes channels of 1-3 m wide and 0.2-0.5 m deep in the seabed ([Degrendele et al. 2010](#)²⁰⁵⁵⁵⁸). The *Royal Decree of 1 September 2004 – EIA*, stipulates the different effects of sand extraction on the marine environment that need to be taken into account in the environmental assessment report (tables 3 and 4).

Table 3. An overview of the effects of sand extraction on the environment.

ENVIRONMENTAL IMPACT	LITERATURE
Seabed and water (changes in the bathymetry, sedimentology, sediment plumes, turbidity, hydro-dynamic regime, etc.)	de Groot 1996 ²⁹²⁴⁷ , Seys 2003 ³⁶²⁵⁷ , Verfaillie et al. 2005 ⁷⁸²⁹⁸ (GAUFRE project BELSPO), MER voor de extractie van mariene aggregaten op het BNZ, 2006 ¹⁰¹³⁸⁷ , Van Lancker et al. 2007 ¹²⁶³⁵⁰ (MAREBASSE project BELSPO), Vanaverbeke et al. 2007 ¹⁰⁹²⁹⁷ (SPEEK project BELSPO), Van den Eynde et al. 2008 , Van Lancker et al. 2009 ²¹¹⁹⁵³ (QUEST4D project BELSPO), Van den Eynde & Norro, 2009 ¹⁴³²⁶⁵ , MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010 ²¹⁴⁸⁵⁷ , Van Lancker et al. 2010 ²⁰⁵⁵⁶⁷ , Bellec et al. 2010 ²⁰⁵⁵⁵⁶ , Degrendele et al. 2010 ²⁰⁵⁵⁵⁸ , Van den Eynde et al. 2010 ²⁰⁵⁵⁶¹ , Garel 2010 ²⁰⁵⁵⁵⁹ , Roche et al. 2011 ²⁰⁸⁶⁸¹ , De Sutter & Mathys 2011 ²⁰⁸⁷⁶⁷
Fauna, flora and biodiversity	Seys 2003 ³⁶²⁵⁷ , Verfaillie et al. 2005 ⁷⁸²⁹⁸ (GAUFRE project BELSPO), MER voor de extractie van mariene aggregaten op het BNZ, 2006 ¹⁰¹³⁸⁷ , Vanaverbeke et al. 2007 ¹⁰⁹²⁹⁷ (SPEEK project BELSPO), Hostens et al. 2008 , MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010 ²¹⁴⁸⁵⁷ , De Backer et al. 2010 ¹⁴⁴⁶⁹⁵ , Bonne 2010 ²⁰⁵⁵⁶⁶ , De Backer et al. 2011 ²⁰⁸⁶⁹⁰ , De Sutter & Mathys 2011 ²⁰⁸⁷⁶⁷
Air quality and climate	MER voor de extractie van mariene aggregaten op het BNZ, 2006 ¹⁰¹³⁸⁷ , MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010 ²¹⁴⁸⁵⁷ , De Sutter & Mathys 2011 ²⁰⁸⁷⁶⁷
Noise and vibrations	MER voor de extractie van mariene aggregaten op het BNZ, 2006 ¹⁰¹³⁸⁷ , MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010 ²¹⁴⁸⁵⁷ , De Sutter & Mathys 2011 ²⁰⁸⁷⁶⁷

Table 4. An overview of the effects of sand extraction on the other users.

IMPACT ON USERS	LITERATURE
Risks and safety (shipping, oil pollution, coastal protection, etc.)	<i>MER voor de extractie van mariene aggregaten op het BNZ, 2006</i> ¹⁰¹³⁸⁷ , <i>Verwaest et al. 2008</i> ¹²⁷²¹⁵ , <i>MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010</i> ²¹⁴⁸⁵⁷ , <i>De Sutter & Mathys 2011</i> ²⁰⁸⁷⁶⁷
Seascape and cultural heritage	<i>MER voor de extractie van mariene aggregaten op het BNZ, 2006</i> ¹⁰¹³⁸⁷ , <i>MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010</i> ²¹⁴⁸⁵⁷ , <i>De Sutter & Mathys 2011</i> ²⁰⁸⁷⁶⁷
Interaction with other human activities (incl. coastal protection)	<i>Verfaillie et al. 2005</i> ⁷⁸²⁹⁸ (GAUFRE project BELSPO), <i>Verwaest & Verelst 2006</i> ¹¹⁵⁴⁵⁰ , <i>MER voor de extractie van mariene aggregaten op het BNZ, 2006</i> ¹⁰¹³⁸⁷ , <i>Verwaest 2008</i> ¹²⁷²¹⁵ , <i>MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010</i> , <i>De Sutter & Mathys 2011</i> ²¹⁴⁸⁵⁷
Cumulative effects (e.g. in combination with activities in the offshore wind farms)	<i>MER voor de extractie van mariene aggregaten in de exploratiezone van het BNZ, 2010</i> ²¹⁴⁸⁵⁷ , <i>De Sutter & Mathys 2011</i> ²⁰⁸⁷⁶⁷

4.5 Sustainable use

Within the OSPAR region, all countries that extract sand and gravel on a large scale have to comply with the European Directive 85/337/EEC concerning the EIA of specific public and private projects as well as the European Habitats Directive (92/43/EC). With regard to the management of marine sediment extraction, the OSPAR countries have agreed to apply the directives as proposed by the International Council for the Exploration of the Sea (ICES) (see annex 10 of *Report of the Working Group on the effects of extraction of marine sediments on the marine ecosystem (ICES, WGEXT) 2003*¹⁰⁵⁴²⁵). These directives also discuss nature conservation and spatial conflicts between users. Belgium, Denmark, Germany, the Netherlands and the United Kingdom have made the use of the 'black box' system which monitors the extraction in space and time mandatory. The effects of the sand and gravel extraction on the marine environment are followed up by the ICES working group WGEXT. Belgium is represented in this working group by MUMM and the Institute for Agricultural and Fisheries Research (ILVO).

At the European level, the impact on the marine environment caused by the extraction of sediments is also included in the Marine Strategy Framework Directive (2008/56/EC) (MSFD, see also Royal Decree of 23 June 2010). In the MSFD, several descriptors for a good environmental status (GES) relevant to the extraction of marine sediments are identified: seafloor integrity (more information: *Rice et al. 2010*²⁰²⁴⁹⁰), underwater noise and other forms of energy (more information: *Tasker et al. 2010*²⁰²⁴⁹³) and the permanent alteration of the hydrographical conditions. Furthermore, the selective extraction due to exploration and exploitation of living and non-living resources on the seabed and subsoil is listed among the pressures and impacts. The European Habitats Directive (see also Royal Decree of 14 October) offers a framework to protect ecologically important areas such as the gravel beds in the BNS against pressures such as sediment extraction (*Degrendele et al. 2008*¹²⁷²⁶², *Houziaux et al. 2008*¹⁴⁰⁷⁵⁶, *Degraer et al. 2009*¹⁴³³⁶³). The implications for the extraction in the Natura 2000 areas are discussed in *Raeymaekers et al. (2011)*²⁰⁸⁷³⁴. In the draft of the Marine Spatial Plan (*Ontwerp van koninklijk besluit tot vaststelling van het marien ruimtelijk plan, 2013*²²⁷⁵²⁷), as proposed by the Minister competent for the North Sea, measures are formulated with regard to the sand extraction activities in order to protect the Habitats Directive Areas.

The sand and gravel extraction in the BNS is monitored by the Continental Shelf Service (the FPS Economy), MUMM and ILVO (*Brochure Dienst Continentaal Plat 2008*¹²⁷²¹³, *Roche et al. 2011*²⁰⁸⁶⁸¹, *De Backer et al. 2011*²⁰⁸⁶⁹⁰, *Van Lancker et al. 2011*²⁰⁸⁶⁹⁷). Each concessionaire needs to pay a fee in proportion to the extracted volume. This fee is used to finance the ongoing research into the impact of exploitation and exploration activities on the marine environment and the seabed (*Degrendele 2008*²²⁵⁴¹⁶, *Brochure Dienst Continentaal Plat 2008*¹²⁷²¹³).

The extraction activities are controlled by means of the registers of the dredgers on the one hand and by means of the 'black box' system (Electronic Monitoring System, EMS) on the other. This system was introduced in 1996 and is managed by the MUMM, as commissioned by the Continental Shelf Service (*Degrendele 2008*²²⁵⁴¹⁶, *Roche et al. 2011*²⁰⁸⁶⁸¹). Furthermore, the physical impact of extraction on the seabed is monitored by the Continental Shelf Service and MUMM. The sediment volumes in the control zone are followed up by means of the research vessel Belgica. In

this regard, a maximum of 5 m of sediment may be removed compared to the original level of the seabed ([Roche et al. 2011](#)²⁰⁸⁶⁸¹). MUMM is responsible for monitoring the hydrodynamics and the sediment transport by means of models and measurements ([Van den Eynde et al. 2010](#)²⁰⁵⁵⁶¹, [Van Lancker et al. 2011](#)²⁰⁸⁶⁹⁷). The biological environment research group of ILVO examines the ecological impact of the extraction activities as well as the biological evolution after cessation of the activities ([De Backer et al. 2010](#)¹⁴⁴⁶⁹⁵, [De Backer et al. 2011](#)²⁰⁸⁶⁹⁰). In the exploitation zone 4, an elaborate 'base line' study was executed to estimate the impact of the extraction activities ([Mathys et al. 2011](#)²⁰⁸⁷⁶³).

Furthermore, specific studies and research projects such as BUDGET ([Lanckneus et al. 2001](#)²⁴⁸⁴⁵, [BUDGET project BELSPO](#)), [SPEEK](#) ([Vanaverbeke et al. 2007](#)¹⁰⁹²⁹⁷, [SPEEK project BELSPO](#)), [MAREBASSE](#) ([Van Lancker et al. 2007](#)¹²⁶³⁵⁰, [MAREBASSE project BELSPO](#)), [EUMARSAND](#) ([Van Lancker et al. 2010](#)²⁰⁵⁵⁴⁸, EU-FP6-project) and [QUEST4D](#) ([Van Lancker et al. 2009](#)²¹¹⁹⁵³, [QUEST4D project BELSPO](#)) contribute to a better understanding of the impact and a sustainable management of the sand and gravel extraction.

Legislation reference list

Table with European legislation. The consolidated version of this legislation is available on [Eurllex](#).

EUROPEAN LEGISLATION			
Abbreviations (if available)	Title	Year	Number
Directives			
EIA Directive	Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment	1985	337
Habitats Directive	Directive on the conservation of natural habitats and of wild fauna and flora	1992	43
Marine Strategy Framework Directive	Directive establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)	2008	56

Table with Belgian and Flemish legislation. The consolidated version of this legislation is available on [Belgisch staatsblad](#) and the [Justel-databases](#).

BELGIAN AND FLEMISH LEGISLATION	
Date	Title
Laws	
Wet van 13 juni 1969	Wet inzake de exploratie en exploitatie van niet-levende rijkdommen van de territoriale zee en het continentaal plat
Wet van 20 januari 1999	Wet ter bescherming van het mariene milieu en ter organisatie van de mariene ruimtelijke planning in de zeegebieden onder de rechtsbevoegdheid van België
Royal Decrees	
KB van 12 augustus 2000	Koninklijk besluit tot instelling van de raadgevende commissie belast met de coördinatie tussen de administraties die betrokken zijn bij het beheer van de exploratie en de exploitatie van het continentaal plat en van de territoriale zee en tot vaststelling van de werkingsmodaliteiten en –kosten ervan
KB van 1 september 2004 – toekenningsprocedure	Koninklijk besluit betreffende de voorwaarden, de geografische begrenzing en de toekenningsprocedure van concessies voor de exploratie en de exploitatie van de minerale en andere niet-levende rijkdommen in de territoriale zee en op het continentaal plat
KB van 1 september 2004 – milieueffectenbeoordeling	Koninklijk besluit houdende de regels betreffende de milieu-effectenbeoordeling in toepassing van de wet van 13 juni 1969 inzake de exploratie en exploitatie van niet-levende rijkdommen van de territoriale zee en het continentaal plat
KB van 14 oktober 2005	Koninklijk besluit tot instelling van speciale beschermingszones en speciale zones voor natuurbehoud in de zeegebieden onder de rechtsbevoegdheid van België
KB van 23 juni 2010	Koninklijk besluit betreffende de mariene strategie voor de Belgische zeegebieden
Ministerial Decrees	
MB van 24 december 2010	Ministerieel besluit betreffende de afbakening van sectoren in exploratiezone 4 voor de exploratie en de exploitatie van de niet-levende rijkdommen van de territoriale zee en het continentaal plat

